Photodiode as current source

Student Group

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Photo Diode as current source

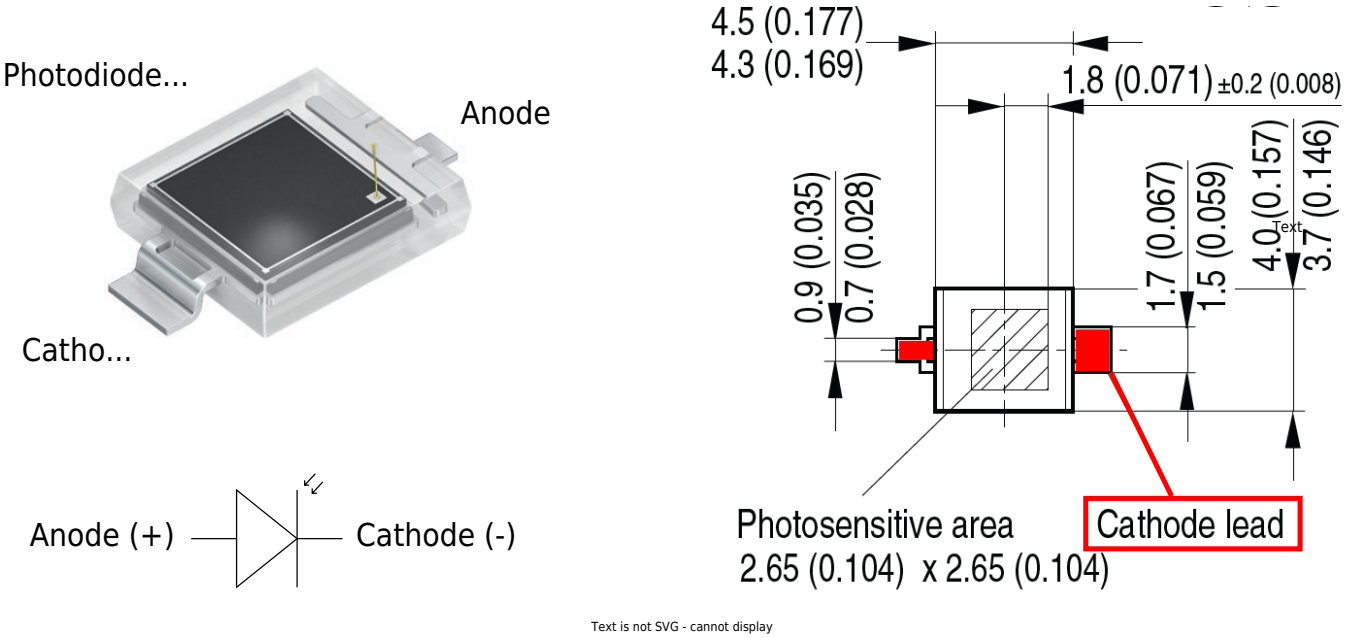

Fig. 1: Inverting Op-Amp: Photo Diode BPW 34 S

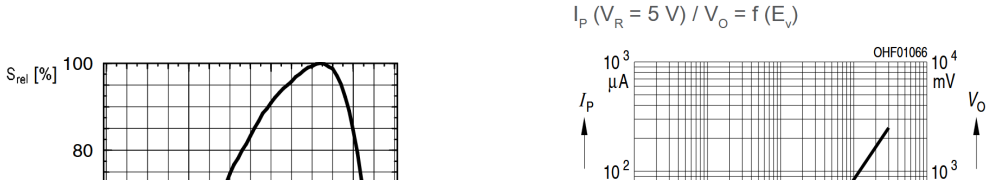

Fig. 2: Inverting Op-Amp: Diagramms of BPW 34 S

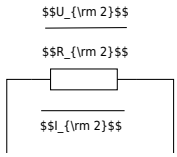

Fig. 3: Inverting Op-Amp: Photo Diode as current source

$U_{\rm DD}{\rm~=10~V},~U_{\rm SS}{\rm~=-10~V}$

We assume a good illuminated room of 300 lx, illuminated by a white LED. White light is a mixture of many wavelengths across the visible spectrum, roughly 380 to 780 nm.
For a typical white LED, the spectrum usually comes from a blue LED chip with a peak around 450 nm, plus a broader phosphor emission that spreads across green, yellow, and red wavelengths.
For an eaier calculation, we take a mean value of 500 nm which is close to the peak value of the blue LED (in reality a greenish light) and 300 lx for the illumination.
In figure 2 we can see that the sensitivity of the photo diode at 500 nm ist only 30%. The maximim current (100%) at 300 lx is 30 ${\rm\mu}$A.
Now we kan calculate the current we expect from the diode at 300 lx:

$I_{\rm 1} = 30 {\rm~\mu A} * 0.3$
$I_{\rm 1} \approx 10 {\rm~\mu A}$

30% of 30 ${\rm\mu A}$ is roughly 10 ${\rm\mu A}$.

TODO
Complete the arrows in the scematic of the circuit.
Take the values for $U_{\rm 1},~U_{\rm 2},~U_{\rm OUT}$ from .
Use these values to calculate the sum of the voltages at node ${\rm N_{12}}$.
Compare your result by measuerement.

$U_{\rm 1}{\rm~=}$

$U_{\rm 2}{\rm~=}$

$U_{\rm OUT}{\rm~=}$

Calculated $U_{\rm 12}{\rm~=}$

Measured $U_{\rm 12}{\rm~=}$

What are your results?

${\rm .....}$

${\rm .....}$

${\rm .....}$

What will happen if you short-circuit $R_{\rm 2}$?
Try it and explain your results.

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